S.

Alberta
AGRICULTURE

NURSERY TRIALS

1982

INVESTIGATION #25-1982

Monitoring of Transplanted Container Grown Coniferous Stock

Introduction:

At the Alberta Tree Nursery and Horticulture Centre the annual production aim is to grow 3/4 million coniferous transplants. This planting tock is reared for one year in the 36 cubic centimeter Spencer Lemaire Container under greenhouse conditions. Sometimes the seedling might stay in this container for another year but that is an exception.

The coniferous species grown in this manner are white and colorado spruce and lodgepole and scots pine.

After the seedling stock is transplanted during the period of August to September, the transplants grow for 3 years in the field for spruce and 2 years for pine. Transplant spacings are 45 cm between rows and from 4 cm to 10 cm in the row.

Objective of Investigation:

The purpose of this trial is to assess over a number of years of observation, the root and shoot development of coniferous transplants of various ages.

Method:

This investigation was started in 1979 and carried out yearly until 1982. During August, 20 samples of each species and each age group are taken from the field. Roots are washed, collar diameters and total top growth are measured. Hereafter the plants are dried in a kiln and root and shoot mass (dry weights) are measured.

Part of the recorded data is an analysis of the nutrient values of the fields in which these seedlings grow. These fields are tested for N, P, K, and pH and organic matter content during the summer and the results are an indication of the general fertility of the growing site.

Observations:

In 1982 the transplant samples were taken during September. Table I records the collected data of species, location, age and plant measurements. The corresponding data of the soil analysis is listed in Table II.

Discussion of Presented Data:

The data presented from the 1982 observation should be compared with the 1981, 1980 and 1979 growth years, in order to be able to observe a trend of development. Such a summary is compiled in Table IV.

TABLE I: Quality Monitoring of Coniferous Transplants
From Samples of 20 Trees
As of September 1982

SPECIES	AGE	FIELD	SHOOT LENGTH cm	COLLAR DIAMETER mm	OVENDRY WEIGHT (g)		TOP:ROOT RATIO*
					TOP	ROOT	
White	1c-1	13, D	20.78	4.75	4.85	1.45	3:1
Spruce	1-2	32A, E	41.43	12.50	57.20	11.40	5:1
	1c-3	32D, E	53.58	13.86	74.60	16.25	5:1
Colorado	1c-1	19, A	19.99	6.41	7.00	2.65	3:1
Spruce	1c-2	19, A	50.33	14.27	93,90	19.50	5:1
	1c-3	17, B	40.41	14.25	92.60	17.20	5:1
Lodgepole	1c-1	13, C	19.83	6.17	11.30	3.10	4:1
Pine	1c-2	32A, W	32.44	10.59	44.75	8.60	5:1
Scots	1c-1	16, A	24.49	5.30	9.90	2.10	5:1
Pine	1c-2	32A, W	29.33	9.32	30.70	5.10	6:1

NOTE: * of Ovendry Weights

TABLE II Results of Soil Tests

FIELD	TESTED	AVAILABLE PLANT NUTRIENTS lb/2m NITROGEN (N)	PHOSPHORUS (P)	POTASSIUM (K)	SOIL REACTION (pH)	TEXTURE	ORGANIC MATTER
13c	13/10-82	27	26	390	7.0	Clay	8.0
13d	13/10-82	26	32	240	5.7	Clay Loam	8.1
16a	13/10-82	18	28	480	6.4	Clay	7.2
17b	5/5 -82	44	78	450	6.0	Loam	8.3
19a	13/10-82	10	38	310	5.9	Clay Loam	6.7
32a,e	5/5 -82	102	120	520	6.0	Loam	7.9
32a,w	5/5 -82	36	120	410	5.6	Loam	8.0
32d,e	5/5 -82	14	52	340	6.4	Sandy Loam	3.6

TABLE III

SPECIES	AGE	MIN. HEIGHT (CM)	MAX. HEIGHT (CM)
SPRUCE	1-1	11.4	24.6
Colorado &	1-2	17.0	41.4
White	1-3	33.6	56.9
PINE	1-1	15.2	25.6
Lodgepole &	1-2	29.3	43.0
Scots			

The following comments can be made:

1. During growing seasons as transplants the height variations of the measured plants fluctuate as indicated in Table III.

2. The top/root ratio increases during the 3 and 2 year growing season as follows:

   FOR SPRUCE: from 2:1 - 5 or 6:1 (in 3 years)

   FOR PINE: from 10 or 4:1 - 4 or 6:1 (in 2 years)

3. Collar diameter for mature 1,3 spruce and 1,2 pine fluctuates as follows:

MATURE TRANSPLANTS	STEM DIAMETER IN MM	
	MINIMUM	MAXIMUM
4 year spruce	10.2	14.3
3 year pine	8.5	14.0

It should be noted here that pine was grown at the nursery as a 1,3 transplant. However, this practice is now changed to production of a 1,2 plant, since the 4 year old pines become too large for shipping to the farmers.

4. Fertility levels in the fields and in the same field over a 2 or 3 year period fluctuate widely. It appears that in the spruce transplant fields 11A, 32C east, 32B east, 32C west, the fertility levels decrease within the 2-3 year growing period. However, this is just the opposite of fields 32A east, 32D east and 17B. Except were noted no fertilizer application was made during the growing period. The fertilizing was done prior to planting. In the pine fields only 2 reliable soil smaples apply and no trend seems to show up.

   In general the available nutrients fluctuate from low to high in the various fields as follows:

	AVAILABLE NUTRIENTS IN LBS/ACRE		
	N	P	K
Minimum	4	23	170
Maximum	102	120	520

NOTE: Only complete soil samples are recorded here. It does not appear to be valid to break up a N, P, K, combination.

The pH values fluctuate from 5.6 minimum to 6.8 maximum which is well within the recommended range.

Conclusion:

The recorded data gives a broad picture of the growing conditions and growth performance of the coniferous transplants. This data can be used when discussing growing details with nurserymen.

With the extremely high Shoot/Root ratio in the final product that more attention will have to be placed on the K & P component of our fertilizer program. It is important to maintain a low Shoot/Root ratio to give a seedling ability to be transplanted with success.

TABLE IV: MONITORING OF TRANSPLANTED CONTAINER CONIFEROUS STOCK
'79, '80, '81, '82 Observation Results

SPECIES	FIELD	YEAR	AGE	SHOOT LENGTH (cm)	STEM DIAMETER (mm)	TOP:ROOT RATIO	AVAILABLE PLANT NUTRIENTS N	P	K	SOIL REACTION (pH)	NOTES
WHITE SPRUCE	32C,E	1979	1c-1	20.30	6.40	2:1	44	43	366	5.7	11-48-0 @ 100 Kg/ha
		1980	1c-2	33.03	9.04	5:1	19	60	265	5.9	
		1981	1c-3	37.72	11.58	5:1	4	23	170	5.9	
	32B,E	1979	2c-2 3c-2	37.85	10.33	4:1	27	104	529	6.3	46-0-0 @ 140 Kg/ha
		1980	2c-3 3c-3	56.89	13.65	5:1	13	53	205	6.05	
	32C,W	1980	1c-2	35.71	10.25	4:1	44	43	366	6.0	11-48-0 @ 100 Kg/ha
		1981	1c-3	45.96	12.05	6:1	24	30	145	5.5	
	32A,E	1981	1c-1	24.63	6.10	2:1	16	50	220	6.0	1979 application: 46-0-0 @ 75 kg/ha 11-48-0 @ 50 Kg/ha 0-0-60 @ 25 kg/ha
		1982	1c-2	41.43	12.50	5:1	102	120	520	6.0	
	32D,E	1981	1c-2	30.05	7.59	4:1	8	18	135	6.0	No fertilizer - 1979
		1982	1c-3	53.58	13.86	5:1	14	52	340	6.4	
COLORADO SPRUCE	11A	1979	1c-1	11.36	4.16	2:1	48	63	379	6.7	1979: 46-0-0 @ 56 Kg/ha; 11-48-0 @ 56 kg/ha.
		1980	1c-2	17.09	5.84	3:1	27	28	160	6:1	
		1981	1c-3	33.60	10.17	5:1	14	29	185	6:1	
	11A	1980	2c-1	20.83	7.01	3:1	27	28	160	6:1	1980: 46-0-0 @ 50 kg/ha; 0-0-60 @ 50 kg/ha.
		1981	2c-2	27.13	7.80	5:1	14	29	185	6.1	
	17B	1980	1c-1	19.19	6.23	2:1	20	44	265	6.8	1979 - 0-18-0 @ 112 Kg/ha; 46-0-0 @ 28 Kg/ha; 1980: 46-0-0 @ 100 Kg/ha; 1981: none; 1982: 11-48-0 @ 100 Kg/ha, 46-0-0 @ 50 Kg/ha.
		1981	1c-2	29.62	8.87	5:1	16	29	260	6.7	
		1982	1c-3	40.41	14.25	5:1	44	78	450	6.0	

TABLE IV: (Continued)

MONITORING OF TRANSPLANTED CONTAINER CONIFEROUS STOCK
'79, '80, '81, '82 Observation Results

SPECIES	FIELD	YEAR	AGE	SHOOT LENGTH (cm)	STEM DIAMETER (mm)	TOP:ROOT RATIO	AVAILABLE PLANT NUTRIENTS N	P	K	SOIL REACTION (pH)	NOTES
	32B,W	1979	1c-1	19.88	6.37	4:1	45	64	654	6.3	1979: 46-0-0 @
		1980	1c-2	42.97	14.03	6:1	n/a*	n/a	n/a	n/a	140 Kg/ha. *No soil test was taken in 1980.
LODGEPOLE	32B,W	1979	1c-2	34.58	11.97	10:1	45	64	654	6.3	1979: 46-0-0 @
		1980	1c-3	41.53	11.84	6:1	n/a*	n/a	n/a	n/a	140 Kg/ha.
PINE											
	32D,W	1980	1c-1	25.55	5.41	4:1	61	69	419	6.0	1979: No fertilizer
		1981	1c-2	34.73	8.49	4:1	6	17	155	5.7	
	32A,W	1981	1c-1	16.30	4.02	4:1	14	60	340	6.5	1979: 46-0-0 @ 75 kg/ha
		1982	1c-2	32.44	10.59	5.1	36	120	410	5.6	11-48-0 @ 50 Kg/ha; 0-0-60 @ 25 Kg/ha
	32C,E	1979	1c-1	17.71	4.87	5:1	44	43	366	5.7	1979: 11-48-0 @
		1980	1c-2	35.05	10.16	7:1	19	60	265	5.9	100 Kg/ha.
SCOTS											
	32B,W	1979	1c-2	42.03	11.71	10:1	45	64	654	6.3	1979: 46-0-0 @
		1980	1c-3	78.06	18.47	8:1	n/a*	n/a	n/a	n/a	140 Kg/ha.
PINE											
	32A,W	1981	1c-1	15.24	2.97	4:1	14	60	340	6.5	1979: 46-0-0 @
		1982	1c-2	29.33	9.32	6:1	36	120	410	5.6	75 Kg/ha; 11-48-0 @ 50 Kg/ha; 0-0-60 @ 25 Kg/ha.

INVESTIGATION #28-82

This trial was started in 1980 with 6 species (dogwood, trembling aspen and white birch as deciduous species and jack pine, white spruce and siberian larch as coniferous species). A soil mix with 4 different mineral amendments was used, in order to investigate the influence of these additives on the growth performance of the species under test.

Interim reports were submitted for the 1980 and 1981 growth results; the following report documents the 1982 observations.

Observations:

A. Deciduous Species

In this trial all deciduous species except white birch, were winter killed. Control white birch showed an average height increase of 16.15 cm with average leaf size and color. Leaves of birch in treatments #A1 and #A2 varied from small to large.

Treatment #A2 had a slightly higher average height increase than #A1 (#A1 - 21.75 cm; #A2 - 23.25 cm;).

B. Coniferous Species

In this trial all coniferous species, except white spruce, were winter (1980-81) killed. Control white spruce showed very poor color and needle size with brown needles dropping off.

Treatment #B1 No. 1 - dying - many bare twigs.
Treatment #B1 No. 2 and 3 - had good color and needle size
Treatment #B2 No. 1 - dying - top dead
Treatment #B2 No. 2 - some brown needles
Treatment #B2 No. 3 - top dead, bare twigs

Average height increase for treatments #B1 and #B2 was almost identical with #B1, averaging 6.93 cm and #B2 - 6.07 cm.

Table I lists these growth performances throughout the 1982 growing season.

The accummulated effect of the 3 growing seasons can only be demonstrated on the surviving species of white birch and white spruce (See Table II).

The data is exhibited in a graph form in Figure A.

Conclusion:

1. It is unfortunate that during the timespan this trial ran, four of the species under test died off completely while of the remaining spruce one plant out of 3 for the control group died and one plant out of 3 for all the test group died. Cause of the mortality is the severity of exposure of the potted plants to the harsh winter climate.

2. For the surviving specimen, the height increase of the nutrient enriched media is remarkable. The deciduous plant more than doubled the height increment, while the coniferous plant grew 3 times as tall. There does not appear to be any significant difference between the two types of soil mixes used. It does not make much difference to increase bone meal, to double its volume, nor does switching K_2SO_4 for KNO_3 make noticeable difference.

This trial is now completed, however further investigation results of media enrichment are ongoing. (See Investigation 28A '81 and '82.)

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TABLE I: SEASONAL 1982 HEIGHT INCREASES

SPECIES and TREATMENT		DATES 1982					AVE. HEIGHT INCREASE (cm)	
		15.4	25.5	23.6	28.7	30.8		
A. DECIDUOUS SPECIES:								
A WHI	1.	46.4	46.4	48.0	60.0	61.0	14.6)	
	2.	39.8	40.5	45.0	57.0	57.5	17.7)	16.15
A1 WHI	1.	75.5	75.5	82.0	95.5	97.5	22.0)	
	2.	66.0	66.0	77.0	87.0	87.5	21.5)	21.75
A2 WHI	1.	63.0	63.0	73.0	90.0	90.0	27.0)	
	2.	84.0	84.0	89.5	103.5	103.5	19.5)	23.25
B. CONIFEROUS SPECIES:								
B SPR	1.	23.9	23.9	24.0	24.0	24.0	0.1)	
	2.	19.4	19.4	20.0	20.0	20.0	0.6)	0.35
B1 SPR	1.	31.0	33.0	36.0	36.0	36.0*	5.0)	
	2.	27.7	30.5	34.5	38.0	39.0	11.3)	
	3.	27.5	29.5	31.5	32.0	32.0	4.5)	6.93
B2 SPR	1.	33.3	34.0	37.0	37.0	37.0*	3.7)	
	2.	27.5	29.0	35.0	35.5	35.5	8.0)	
	3.	24.5	27.5	31.0	31.0	31.0*	6.5)	6.07

NOTE: * Dead on Top

TABLE II: ANNUAL INCREASE IN HEIGHT (CM)

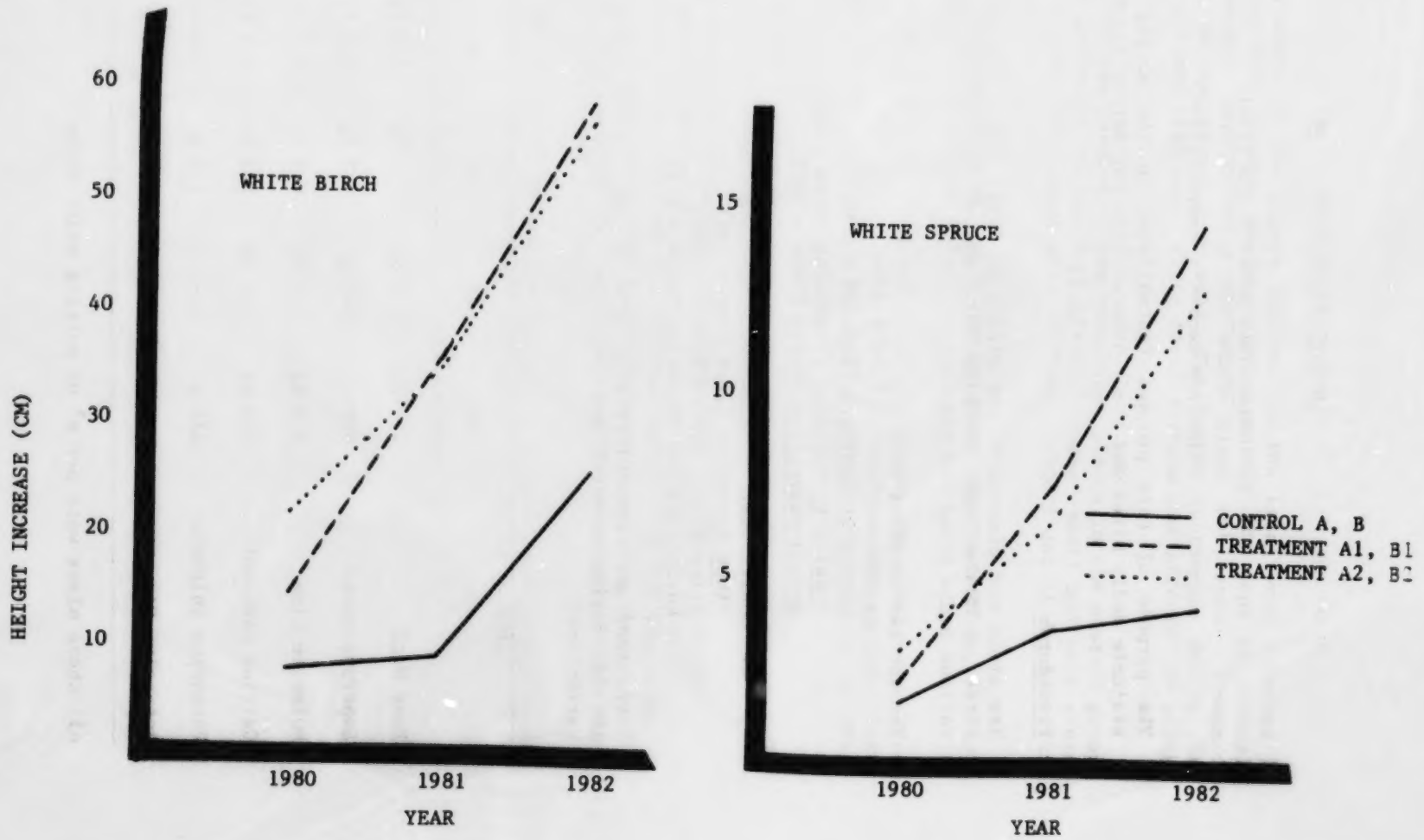
SPECIES AND TREATMENT	ANNUAL HEIGHT INCREASE 1980	1981	1982	TOTAL HEIGHT INCREASE (cm)	REMARKS
A. WHITE BIRCH					
Control A	7.30	2.10	16.15	25.55	Dogwood and Trembling
Treatment A1	13.90	23.45	21.75	59.10	Aspen were Winter
Treatment A2	23.07	11.50	23.25	57.82	(1980 - 81) Killed.
B. WHITE SPRUCE					
Control B	1.87	1.90	0.35	4.12	Jack Pine and Siberian
Treatment B1	2.27	5.13	6.93	14.33	Larch were Winter
Treatment B2	3.10	3.27	6.07	12.44	(1980-81) Killed.

NOTE: Peat, sand and vermiculite were used as the control media in a 2-1-1 ratio for (A) deciduous stock and 1-1-1 for (B) conifers with the following two variations of each:

	A1	A2	B1	B2
Bone Meal - $Ca_3(HPO_4)_2$ KNO_3	1.5 Kg	3.0 Kg	1.5 Kg	3.0 Kg
Super Phosphate - $Ca\ HPO_4$	600 g.	600 g.	1.5 Kg	1.5 Kg
Dolomite Lime - $MGCO_3$ CaO	1.5 Kg	1.5 Kg	4.5 Kg	4.5 Kg
Calcium Carbonate - $CaCO_3$	3.0 Kg	3.0 Kg	1.5 Kg	1.5 Kg
Potassium Sulphate K_2SO_4	------	225 g.	150 g.	300 g.
Potassium Nitrate - KNO_3	225 g.	------	150 g.	------

All above mixes were per m^3 of potting media mixes.

FIGURE A: GROWTH PERFORMANCE OF POTTED DECIDUOUS AND CONIFEROUS SPECIES AS RELATED TO SOIL MIXES



INVESTIGATION #28A - 1982

Container Stock Media Trial

Interim Report - February 1982

The purpose of this project (established in the spring of 1981) was to evaluate media mixes and their adaptability for native stock.

Procedure:

New stock was planted by the middle of April 1981. The three deciduous and three coniferous and controls were potted into 2 gallon pots with five various media mixes and the control.

The species involved were:

A. Deciduous:
- Cornus stolonifera (Dogwood - DOG)
- Populus tremuloides (Trembling Aspen - ASP)
- Betula papyrifera (White Birch - WHI)

B. Coniferous:
- Pinus banksiana (Jack Pine - JAC)
- Picea glauca (White Spruce - SPR)
- Larix sibirica (Siberian Larch - SIB)

Peat, sand and vermiculite were used as the control media in a 2-1-1 ratio for (A) deciduous stock and 1-1-1 for (B) conifers with the following five variations:

	A3	A4	B3	B4	B5
Bone Meal	1.5 Kg	3.0 Kg	1.5 Kg	1.5 Kg	3.0 Kg
Superphosphate	600 g	600 g	1.5 Kg	1.5 Kg	1.5 Kg
Dolomite Lime	1.5 Kg	1.5 Kg	4.5 Kg	4.5 Kg	4.5 Kg
Calcium carbonate	3.0 Kg	3.0 Kg	1.5 Kg	1.5 Kg	1.5 Kg
Potassium Sulphate	225 g	------	150 g	------	------
Potassium Nitrate	------	225 g	------	150 g	300 g

All above mixes were per m^3 of potting media mixes.

Observation:

The height increments of the plants involved in the trial were recorded 5 times during the 1982 growing season. Unfortunately the tops of several plants were damaged; particularily the white birch and aspen. (suspect rabbits feeding on the terminal growth) The height increments during the growing season was not affected. White birch foliage was affected by birch leaf miner.

The size of the foliage needles of the coniferous plants in the control group (B, no nutrient additions to the soil mixture) appear small and pale green while treatment B gave the largest size needles. Table I and II document the height increases.

The recorded height increases of the 6 species under observation in 1981 and 1982 are recorded in figures A and B.

During the two growing seasons this trial was conducted, the plants were kept in a shade frame. The two gallon pots were hand watered but no fertilizer was added. Therefore the controls A and B grew under conditions of minimal soil fertility.

Conclusion:

1. Addition of nutrients in the amounts shown (N, P, K, Ca, and organic bone meal) have a substantial influence on the height developments of container grown birch, dogwood and siberian larch. (60-90% increases are recorded). There is no significant difference between the rates. However, the height increases for the white spruce and jackpine are much less spectacular (15-40% increase).

2. There does not appear to be any worthwhile difference between soil mixes for the deciduous species, at least not after 2 years of growth.

TABLE I: SEASONAL HEIGHT INCREASE IN 1982

A. DECIDUOUS SPECIES

SPECIES and TREATMENT		DATES 1982 15.4	25.5	29.6	28.7	30.8	AVE. HEIGHT INCREASE (cm)	
A								
WHI	1.	29.5*	29.5	43.5	44.5	46.5	17.0)	
	2.	41.0*	41.0	48.5	57.0	60.5	19.5)	15.57
	3.	35.3*	35.3	37.5	44.0	45.5	10.2)	
ASP	1.	19.6	22.5	29.5	46.0	46.0	26.4)	
	2.	24.5	28.0	44.0	49.0	49.5	25.0)	29.00
	3.	23.4	26.0	38.5	58.5	59.0	35.6)	
DOG	1.	46.5	47.5	48.0	55.0	55.5	9.0)	
	2.	47.2	49.2	50.0	54.0	54.0	6.8)	9.77
	3.	14.5	15.6	17.5	28.0	28.0	13.5)	
A3								
WHI	1.	80.5	81.0	83.0	93.0	93.5	13.0)	
	2.	61.5	62.5	66.0	78.0	80.0	18.5)	20.67
	3.	58.0*	58.0	73.0	87.5	88.5	30.5)	
ASP	1.	21.5*	21.5	48.0	52.5	52.5	31.0)	
	2.	29.5*	29.5	60.0	63.0	63.0	33.5)	38.67
	3.	17.5*	17.5	40.5	68.5	69.0	51.5)	
DOG	1.	66.5	68.5	75.0	76.0	77.0	10.5)	
	2.	58.5	65.5	71.5	77.5	79.0	20.5)	13.17
	3.	66.5	68.0	70.5	74.5	75.0	8.5)	
A4								
WHI	1.	78.0	78.5	82.5	94.0	94.5	16.5)	
	2.	68.5*	68.5	72.0	75.0	76.0	7.5)	9.33
	3.	84.0	84.0	84.0	86.0	88.0	4.0)	
ASP	1.	8.5*	8.5	59.5	60.5	61.0	52.5)	
	2.	25.8*	25.8	58.5	78.0	78.0	52.2)	48.40
	3.	4.5*	4.5	31.5	40.5	45.0	40.5)	
DOG	1.	77.5	78.2	80.5	84.0	84.0	6.5)	
	2.	59.0	59.0	64.5	69.0	69.0	10.0)	8.67
	3.	61.0	61.0	65.5	66.0	70.5	9.5)	

* TOP DAMAGED

TABLE II: SEASONAL HEIGHT INCREASE IN 1982

B. CONIFEROUS SPECIES

SPECIES and TREATMENT		DATES 1982 15.4	25.5	23.6	28.7	30.8	AVE. HEIGHT INCREASE (cm)	
B								
SIB	1.	32.8	33.0	38.0	40.5	42.0	9.2)	
	2.	31.4	32.5	38.0	38.0	39.5	8.1)	10.27
	3.	24.0*	24.0	33.0	36.5	37.5	13.5)	
SPR	1.	31.0	33.5	35.0	35.0	35.5	4.5)	
	2.	24.5	24.5	25.0	25.0	25.0	0.5)	3.77
	3.	17.2	17.5	20.5	23.0	23.5	6.3)	
JAC	1.	37.9	41.0	42.0	43.0	43.0	5.1)	
	2.	31.0	34.2	35.0	35.0	35.0	4.0)	3.97
	3.	30.2	31.5	33.0	33.0	33.0	2.8)	
B3								
SIB	1.	45.5	46.5	58.0	73.0	73.5	28.0)	
	2.	44.5	44.5	45.0	49.0	52.0	7.5)	21.17
	3.	39.0	41.0	51.0	66.5	67.0	28.0)	
SPR	1.	21.0	21.0	23.5	23.5	24.5	3.5)	
	2.	31.5	34.0	39.0	39.0	39.0	7.5)	6.67
	3.	31.0	32.4	38.5	39.5	40.0	9.0)	
JAC	1.	35.5	41.0	46.0	46.0	46.5	11.0)	
	2.	30.0	34.0	37.5	37.5	37.5	7.5)	9.50
	3.	29.5	34.2	36.0	38.0	39.5	10.0)	
B4								
SIB	1.	34.5	36.5	48.5	61.0	61.5	27.0)	
	2.	48.0	49.0	52.0	73.5	74.0	26.0)	26.17
	3.	47.0	49.0	51.0	72.0	73.0	25.5)	
SPR	1.	34.0	34.0	35.0	38.5	39.0	5.0)	
	2.	31.0	32.0	36.0	37.5	38.0	7.0)	5.40
	3.	27.3	29.0	31.0	31.0	31.5	4.2)	
JAC	1.	34.0	39.0	45.5	45.5	46.5	12.5)	
	2.	39.0	44.0	50.5	51.0	51.0	12.0)	11.33
	3.	28.5	32.0	36.0	37.0	38.0	9.5)	

SPECIES and TREATMENT		DATES 1982					AVE. HEIGHT INCREASE (cm)	
		15.4	25.5	23.6	28.7	30.8		
B5								
SIB	1.	43.4	45.5	50.5	72.0	72.0	28.6)	
	2.	37.0	41.0	41.0	43.0	44.0	7.0)	22.30
	3.	48.6	51.0	57.0	79.5	80.0	31.4)	
SPR	1.	32.0	35.2	38.0	39.0	39.0	7.0)	
	2.	30.0	32.5	36.0	36.0	36.0	6.0)	10.40
	3.	31.3	35.0	39.5	49.0	49.5	18.2)	
JAC	1.	36.0	42.5	47.5	49.0	49.0	13.0)	
	2.	36.5	43.5	49.0	49.5	49.5	12.5)	10.73
	3.	30.8	34.0	37.0	37.5	37.5	6.7)	

* Top Damaged

FIGURE A: GROWTH PERFORMANCE OF POTTED DECIDUOUS SPECIES AS RELATED TO SOIL MIXES

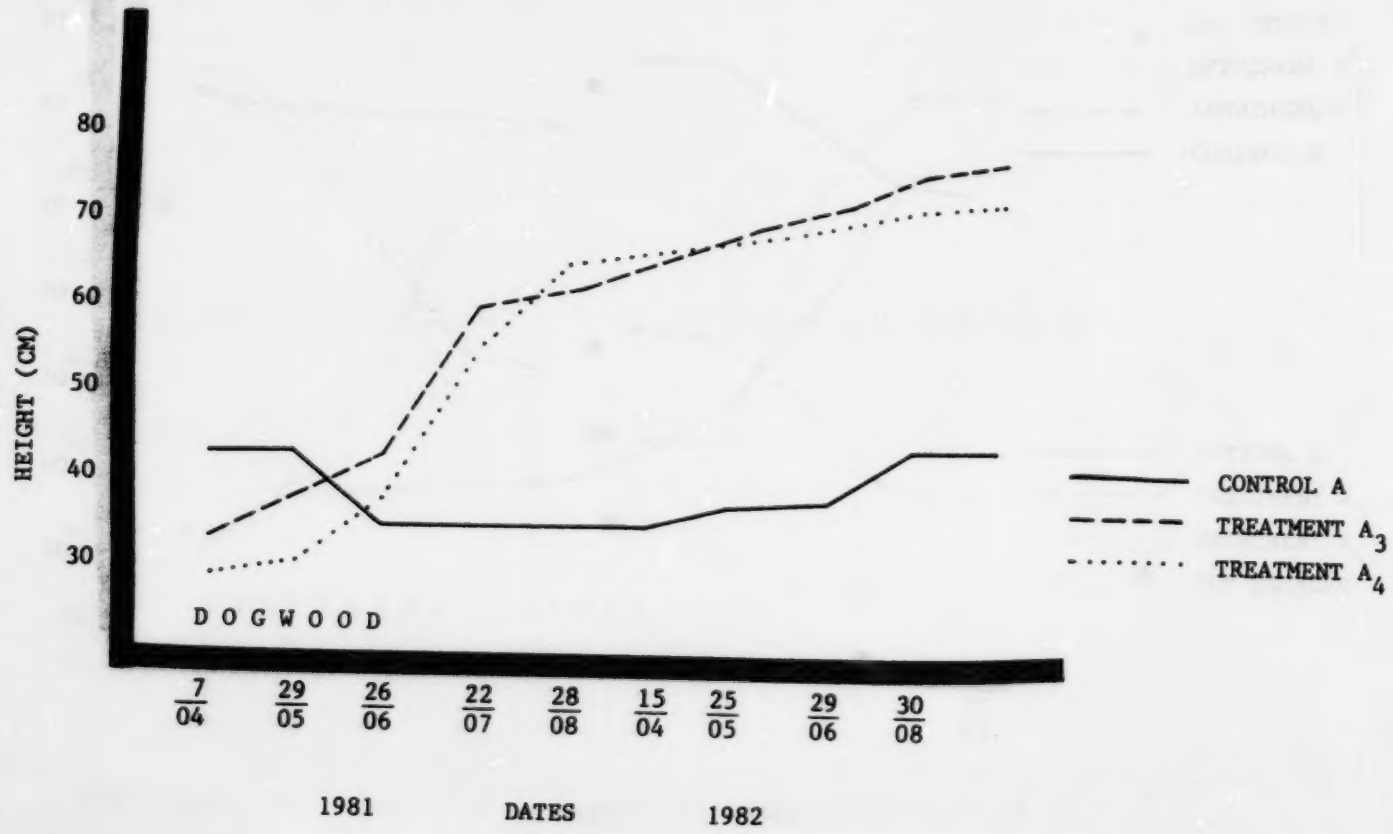


FIGURE A: GROWTH PERFORMANCE OF POTTED DECIDUOUS SPECIES AS RELATED TO SOIL MIXES

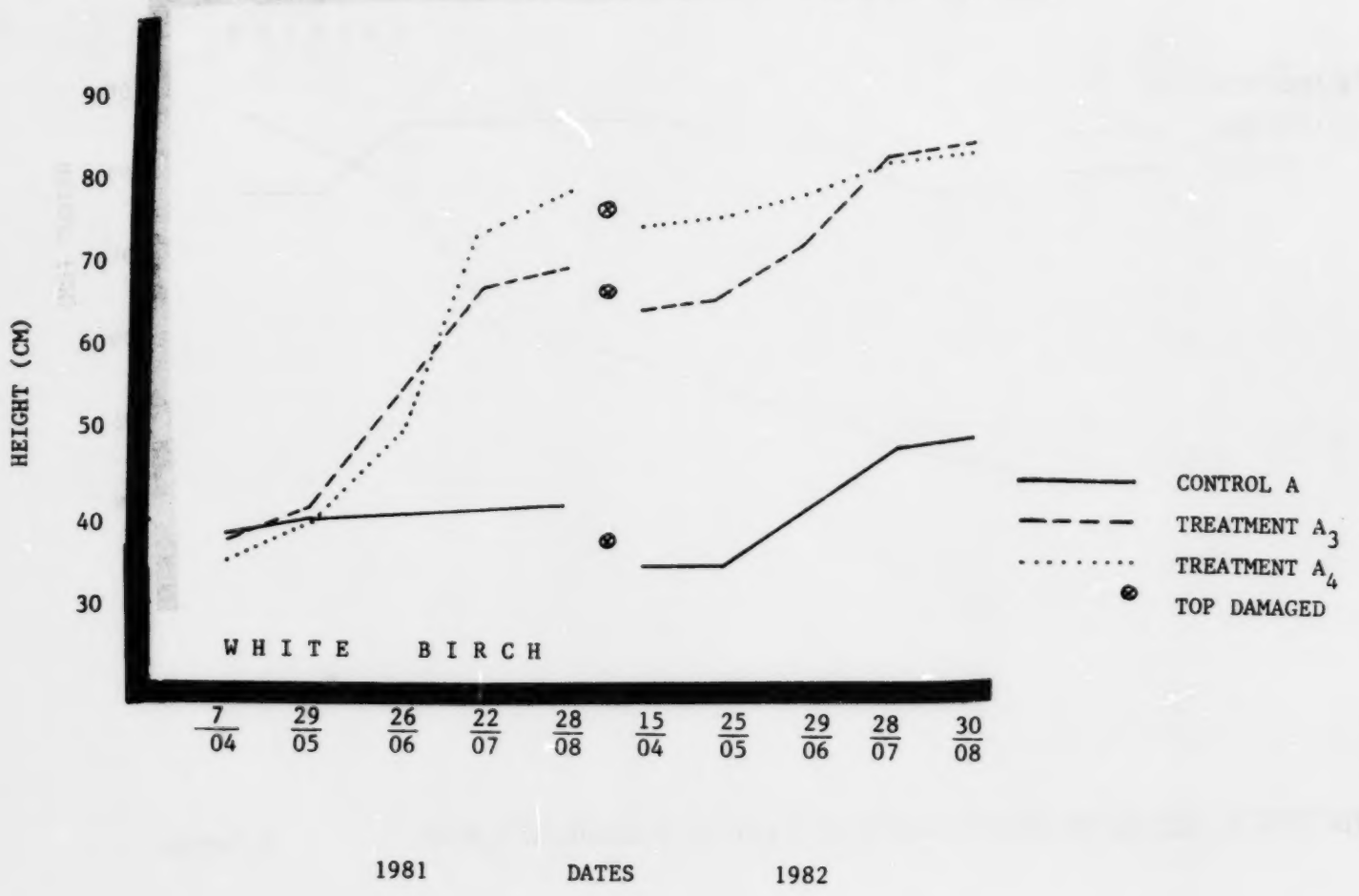


FIGURE A: GROWTH PERFORMANCE OF POTTED DECIDUOUS SPECIES AS RELATED TO SOIL MIXES

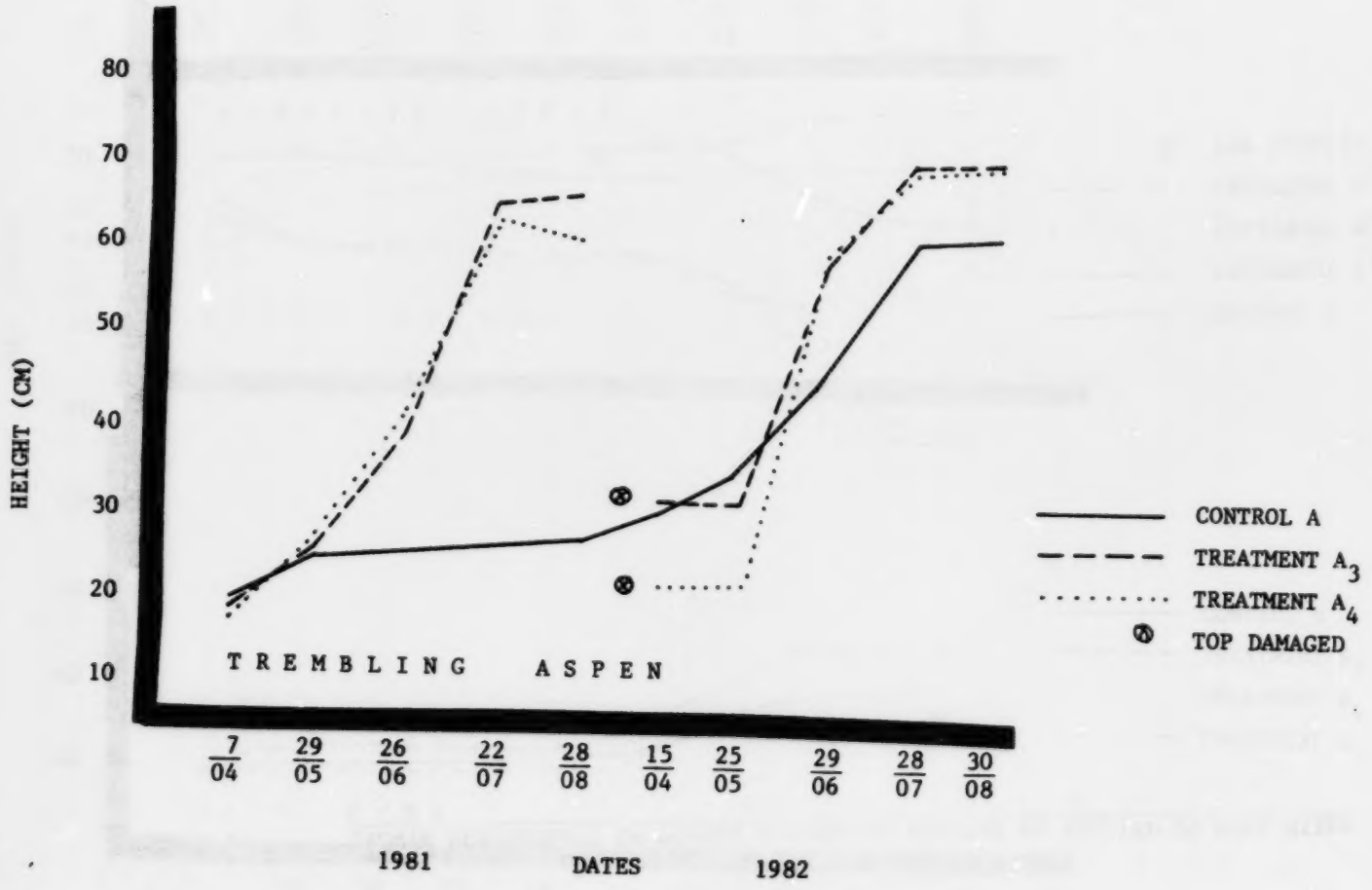


FIGURE B: GROWTH PERFORMANCE OF POTTED CONIFEROUS SPECIES AS RELATED TO SOIL MIXES

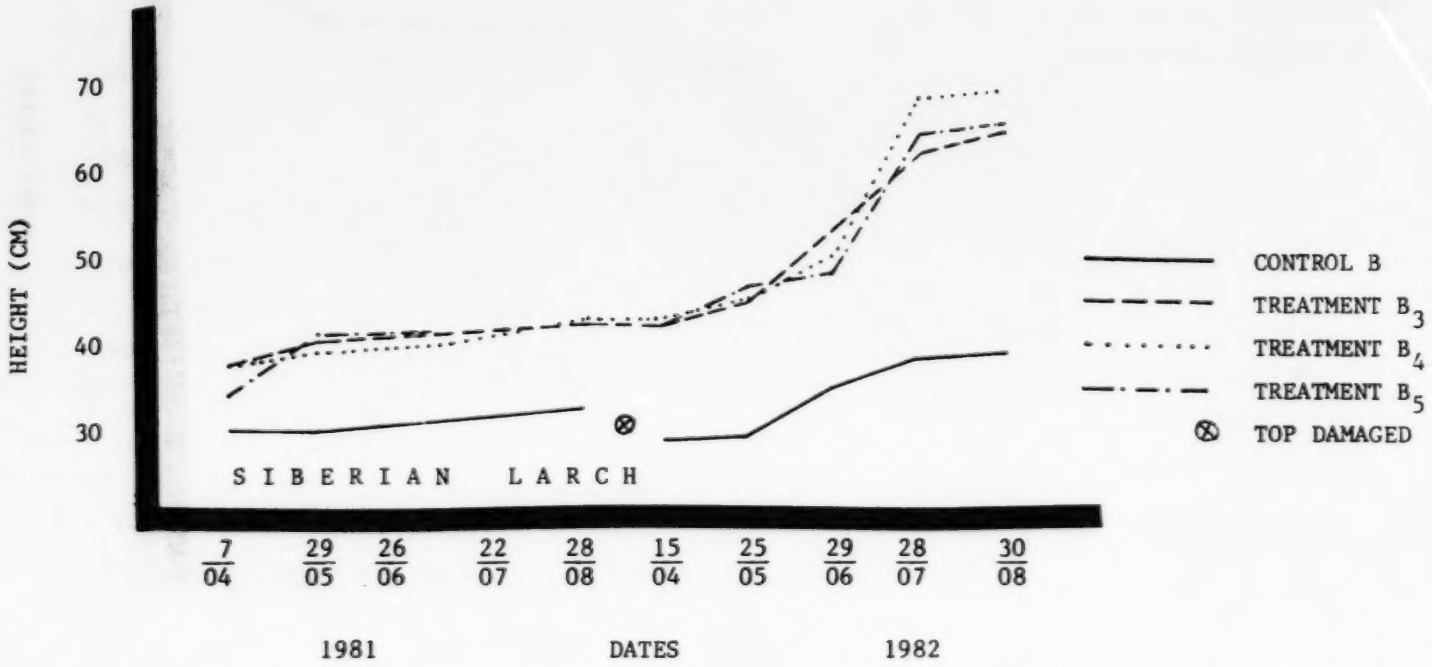
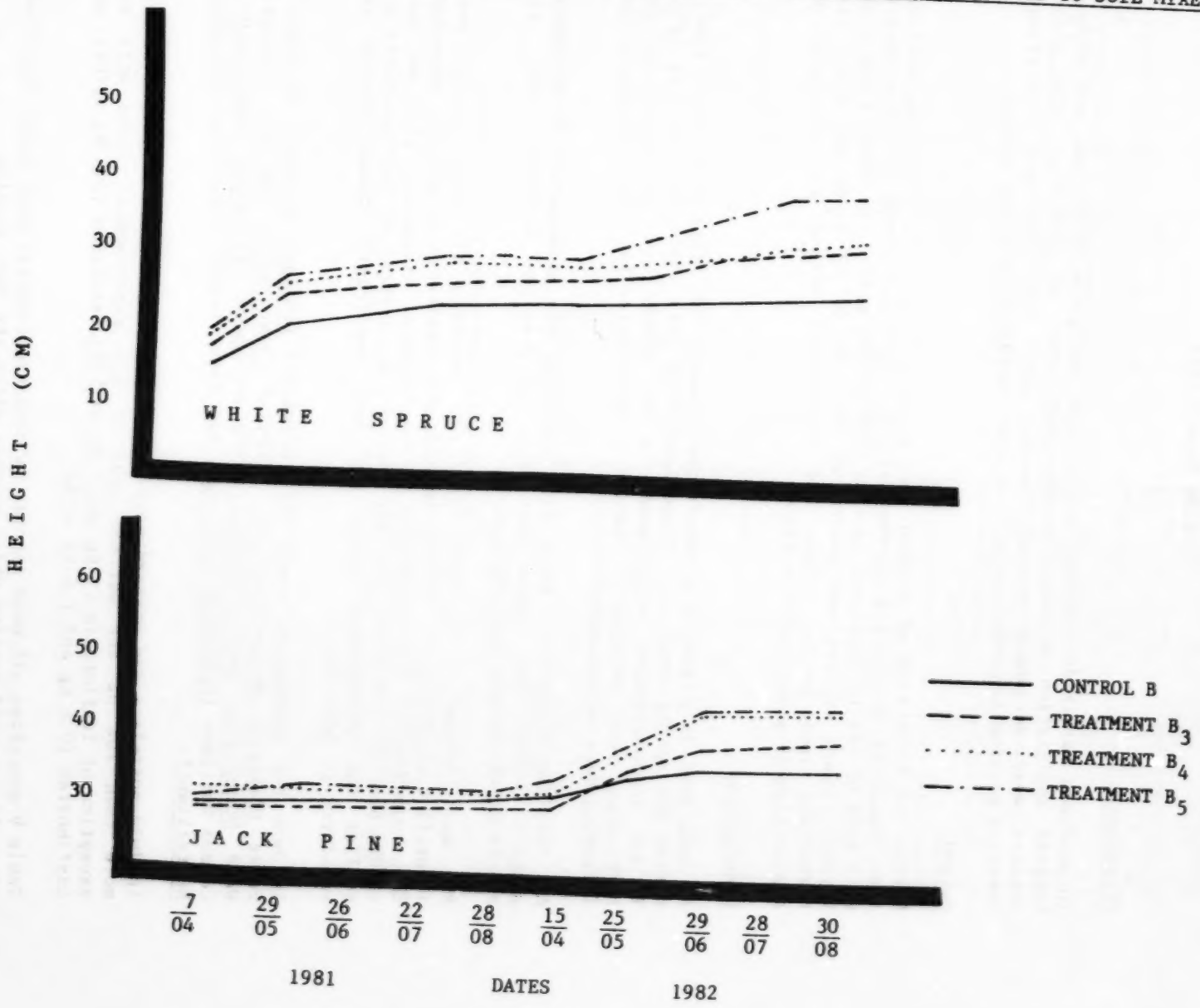


FIGURE B: GROWTH PERFORMANCE OF POTTED CONIFEROUS SPECIES AS RELATED TO SOIL MIXES



INVESTIGATION #39-82

HERBICIDAL WEED CONTROL FOR SEEDED NURSERY CROPS

Interim Report 1982

Objective:

To evaluate herbicides, either pre or post emergence effective, and either topical application or soil incorporated prior to planting. The crops treated were deciduous species, seeded after the seed was stratified. Seedling germination and frequency of weed emergence is being monitored.

Method:

During the first week of October 1981 plots were laid out in 4 replications (see Figure I) in Field 8 of the nursery. Each individual plot was seeded with each of the 11 deciduous species used in the trial (See Table I and Plot Layout). Each species was seeded at the rate of 12 seeds per row. The herbicides used in the trial, the application method and the rate of application is given in Table II.

Observations:

As indicated in Figure I a considerable number of plots were badly eroded during the spring break up. Consequently the data gathered from this trial is not representative since seeds of the plants and the effect of the herbicides were physically removed. Notwithstanding this drawback the following data is presented:

A. Seedling Emergence. Table III summarizes the germination of deciduous species seeded. Two counts were done, in June and September 1982. All plants which emerged appeared healthy.

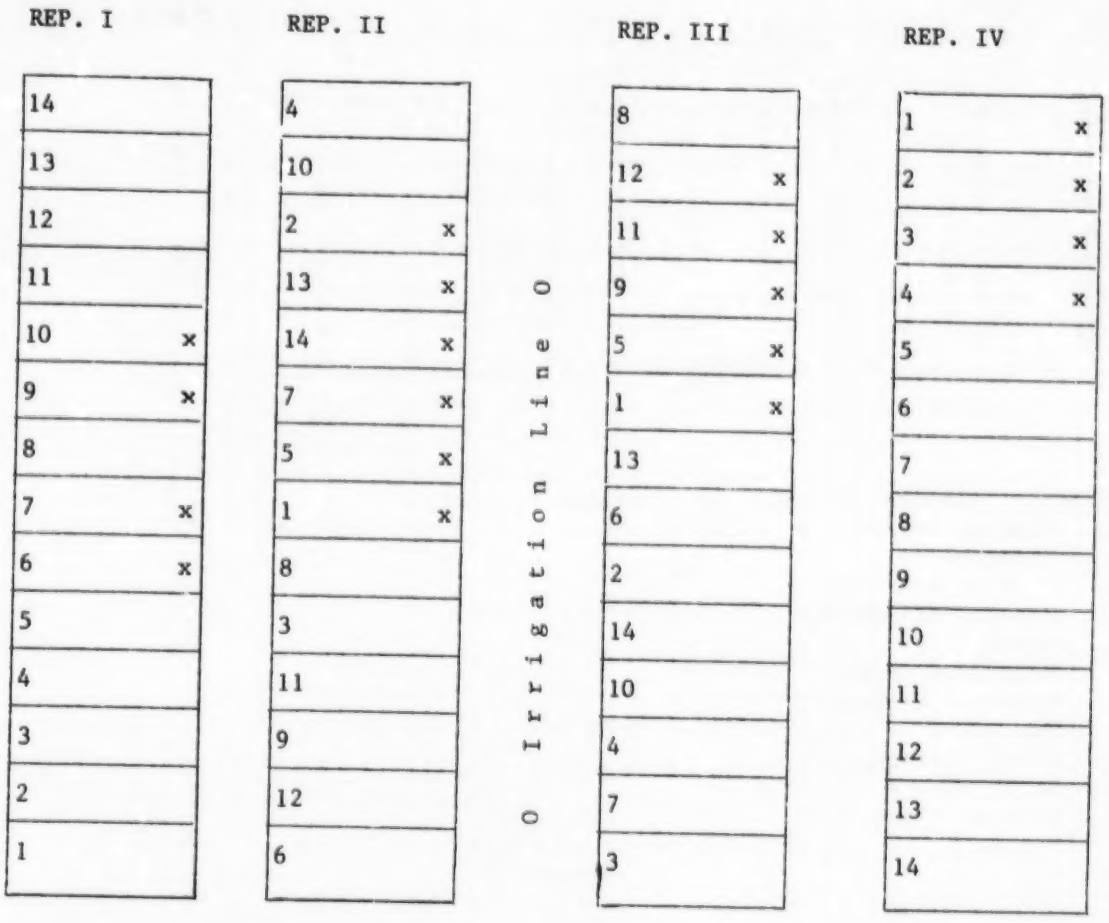
B. Weed Control. In June, prior to weeding, all weed species were identified, individually counted in each experimental plot and data recorded. Each experimental plot consisted of one chemical treatment, plus one hand weeded plot and one weedy plot for control, for a total of fourteen plots per replica (56 experimental plots per four replicas). These results are tabulated in Table IV.

In June the predominant weeds were Stinkweed (Thlaspi Arvense), Shepherd's Purse (Capsella Bursa-Pastoris), Flixweed (Descurainia Sophia), Pineapple Weed (Matricaria Matricarioides), Wild Buckwheat (Polygonum Convolvulus), Common Purslane (Portulaca Oleracea), and Spear Leaved Goose-Foot (Monolepis Nuttalliana).

In July portulaca and mustard were the predominant weeds. Portulaca covered more than 70% of the surface area of all experimental plots with the exception of Trifluralin (1 Kg and 2 Kg ai/ha); Oxadiazon (2.5 Kg ai/ha); and Oxyfluorfen (0.8 Kg and 1.6 Kg ai/ha).

Table V specifies all weed species in each experimental plot which reoccured, plus all new weed species which emerged after the June weeding.

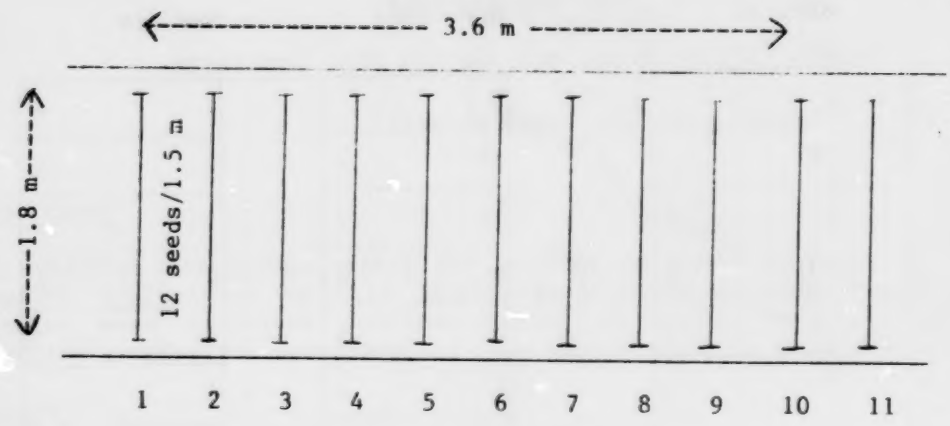
FIGURE I: FIELD PLAN INVESTIGATION #39-82



NOTE: 'x' - plots partially washed out

TABLE I:

PLOT LAYOUT



SPECIES: (Seeded September 30 - October 6, 1981)

1. Nanking Cherry
2. Chokecherry
3. Chinese Bush Cherry
4. Western Sandcherry
5. Mayday
6. Mongolian Cherry
7. Siberian Crabapple
8. Bur Oak
9. Albol Currant
10. Buffaloberry
11. Russian Olive

****

TABLE II: HERBICIDES USED IN TRIAL

	HERBICIDE CHEMICAL NAME	TYPE OF APPLICATION	HERBICIDE TRADE NAME	RATE (Kg ai/ha)
1.	Linuron	PRE	Afolan F	0.85
2.	Linuron	PRE	Afolan F	1.7
3.	Ethalfluralin	PPI	Solanlan 3EC	1.0
4.	Oryzalin	PRE	Surflan 75WP	1.0
5.	Chloroxuron	PRE	Tenoran 50WP	4.0
6.	Trifluralin	PPI	Treflan 4EC	1.0
7.	Trifluralin	PPI	Treflan 4EC	2.0
8.	Napropamide	PRE	Devrinol 50W	2.0
9.	Napropamide	PRE	Devrinol 50W	4.0
10.	Oxadiazon	PRE	Ronstar 2G	2.5
11.	Oxyfluorfen	PRE	Goal	0.8
12.	Oxyfluorfen	PRE	Goal	1.6

PRE - a preemergent herbicide sprayed on after seeding
PPI - a preemergent herbicide incorporated in the soil prior to planting.

TABLE III: PERCENTAGE OF SEEDLING EMERGENCE

TREATMENT	REPLICA	NANKING CHERRY		CHOKECHERRY		CHINESE BUSHCHERRY		WESTERN SANDCHERRY		MAYDAY		MONGOLIAN CHERRY		SIBERIAN CRABAPPLE		BUR OAK		ALBOL CURRANT		BUFFALOBERRY		RUSSIAN OLIVE	
		*	+																				
1	1.	0	0	25	17	0	0	58	83	8	25	8	17	0	0	0	0	0	8	0	17	8	8
	2.	0	0	8	25	0	0	33	33	67	67	8	0	0	0	0	0	8	8	0	8	25	42
	3.	0	0	0	8	0	0	83	83	58	67	33	50	0	8	8	8	0	0	17	17	8	8
	4.	0	0	25	25	0	0	58	67	75	75	33	42	0	0	0	0	0	0	58	75	42	50
	Av.	0	0	14	17	0	0	58	67	52	58	21	27	0	2	2	2	2	4	19	29	21	27
2.	1.	0	0	17	8	0	0	58	58	42	42	8	8	0	0	0	0	0	0	17	58	33	42
	2.	0	0	25	25	0	0	83	92	67	67	8	8	0	0	0	0	0	0	0	25	17	42
	3.	0	0	25	25	0	0	58	67	67	67	25	25	0	0	0	0	17	17	58	67	33	42
	4.	8	8	0	8	0	0	58	58	50	50	8	8	0	0	0	0	0	0	17	17	50	50
	Av.	2	2	17	17	0	0	64	69	56	56	12	12	0	0	0	0	4	4	23	42	33	44
3.	1.	0	8	42	42	0	0	50	75	42	67	8	17	8	8	0	0	0	17	33	42	33	33
	2.	0	0	25	25	8	0	42	58	67	67	25	42	0	0	0	0	0	17	50	50	42	50
	3.	8	8	25	17	0	0	83	67	67	67	8	17	0	0	8	0	0	8	83	92	42	58
	4.	0	0	8	8	0	0	33	25	33	33	8	8	0	0	0	0	0	0	25	17	25	33
	Av.	2	4	25	23	2	0	52	56	52	58	12	21	0	2	2	0	0	10	48	50	35	44
4.	1.	0	0	0	0	0	0	83	83	58	92	8	17	0	0	0	0	0	0	8	17	25	33
	2.	0	0	33	42	0	0	75	83	67	83	17	25	8	8	0	0	8	25	17	42	42	42
	3.	8	0	25	25	0	0	100	92	83	83	42	42	0	8	0	0	8	0	33	25	25	25
	4.	0	0	17	17	0	0	75	75	75	75	33	33	8	8	0	0	0	0	0	8	0	17
	Av.	2	0	19	21	0	0	83	83	70	83	25	29	4	6	0	0	4	6	14	23	23	29
5.	1.	0	0	25	25	0	0	50	83	33	67	8	17	0	0	0	0	0	0	33	42	8	17
	2.	0	0	8	0	0	0	50	42	17	25	8	8	0	0	0	0	0	0	0	0	8	8
	3.	0	0	0	0	0	0	25	42	67	83	17	42	0	0	0	0	0	0	33	33	42	50
	4.	8	8	25	25	0	0	83	83	58	67	33	33	0	0	0	0	0	0	25	25	25	33
	Av.	2	2	14	12	0	0	52	62	44	60	17	25	0	0	0	0	0	0	23	25	21	27
6.	1.	25	25	17	17	0	0	33	25	25	33	8	25	0	0	0	0	0	0	8	33	33	42
	2.	0	0	17	17	0	0	42	42	58	58	0	0	0	0	0	0	0	0	17	33	33	42
	3.	0	0	33	33	0	0	67	83	75	83	33	33	0	0	0	0	0	0	42	50	33	58
	4.	0	0	0	8	0	0	67	58	67	67	0	0	0	0	0	0	0	0	17	17	17	17
	Av.	6	6	17	19	0	0	52	32	56	60	10	15	0	0	0	0	0	0	21	33	29	39

TREATMENT	REPLICA	NANKING CHERRY		CHOKECHERRY		CHINESE BUSHCHERRY		WESTERN SANDCHERRY		MAYDAY		MONGOLIAN CHERRY		SIBERIAN CRABAPPLE		BUR OAK		ALBOL CURRANT		BUFFALOBERRY		RUSSIAN OLIVE	
7.	1.	8	8	8	8	0	0	58	83	42	67	17	17	0	0	0	0	0	0	8	8	17	17
	2.	8	8	25	25	0	0	42	42	25	17	0	8	0	0	0	0	0	0	8	8	8	8
	3.	8	0	8	8	0	33	100	100	67	67	50	58	0	0	0	0	17	17	33	33	50	50
	4.	0	0	8	8	0	0	83	83	42	50	17	25	0	0	0	8	8	8	42	42	42	42
	Av.	6	4	12	12	0	8	71	77	44	50	21	27	0	0	0	2	6	6	23	23	29	29
8.	1.	0	17	33	33	0	0	95	75	58	75	8	8	0	0	0	0	0	0	0	17	0	17
	2.	17	17	33	33	0	0	92	92	33	33	50	50	0	0	0	0	0	17	25	33	33	42
	3.	0	0	33	33	0	0	75	92	92	92	33	42	0	8	0	0	8	8	42	50	17	33
	4.	8	8	8	8	0	0	83	83	92	83	17	25	17	17	0	0	8	0	0	0	33	58
	Av.	6	10	27	27	0	0	81	85	69	71	27	31	4	6	0	0	4	6	17	25	21	37
9.	1.	0	0	33	25	0	0	58	83	50	67	17	25	0	0	0	0	0	0	17	50	42	50
	2.	0	8	50	50	0	0	92	92	58	58	42	42	0	0	0	0	0	8	25	42	33	50
	3.	8	8	0	0	0	0	58	67	58	58	17	25	0	0	0	0	0	0	25	25	0	0
	4.	0	0	25	25	0	0	75	83	67	67	17	17	0	0	0	0	8	25	42	50	25	33
	Av.	2	4	27	25	0	0	75	81	58	62	23	27	0	0	0	0	2	8	27	39	25	33
10.	1.	17	17	17	17	0	0	100	100	92	92	17	42	0	0	0	0	0	0	33	42	25	25
	2.	8	17	42	42	0	0	75	83	67	67	42	42	0	8	0	0	8	8	8	8	8	8
	3.	0	0	25	25	0	0	83	92	75	75	8	17	0	0	0	0	0	0	33	33	8	8
	4.	0	0	25	33	0	0	75	92	25	33	0	0	0	0	0	0	17	17	33	42	0	17
	Av.	6	8	27	29	0	0	83	85	64	67	17	25	0	0	0	0	6	6	27	31	10	15
11.	1.	0	0	8	17	0	0	83	83	42	67	8	33	0	0	0	0	0	0	33	42	42	50
	2.	0	0	42	42	0	0	75	83	67	83	50	50	0	0	0	0	0	0	8	25	17	25
	3.	0	0	0	8	0	0	85	83	33	33	42	42	0	0	0	0	0	0	33	42	25	25
	4.	0	0	8	8	0	0	83	83	58	75	25	25	0	0	0	0	0	0	17	17	8	8
	Av.	0	0	14	19	0	0	79	83	50	64	31	37	0	0	0	0	0	0	23	31	23	27
12.	1.	25	33	17	33	0	0	83	92	92	92	17	25	0	0	0	0	0	0	42	42	42	42
	2.	8	8	8	25	0	0	83	83	92	92	33	33	0	0	0	0	0	0	8	25	33	42
	3.	17	17	17	17	0	0	50	75	33	42	17	25	8	8	8	0	0	0	33	42	42	50
	4.	25	25	17	17	0	0	83	92	50	67	33	42	0	8	0	0	8	8	25	25	17	17
	Av.	19	21	14	23	0	0	75	85	67	71	25	31	2	4	2	0	2	2	27	33	33	37

TREATMENT	REPLICA	NANKING CHERRY		CHOKECHERRY		CHINESE BUSHCHERRY		WESTERN SANDCHERRY		MAYDAY		MONGOLIAN CHERRY		SIBERIAN CRABAPPLE		BUR OAK		ALBOL CURRANT		BUFFALOBERRY		RUSSIAN OLIVE	
13.	1.	8	8	17	17	0	0	67	92	50	67	17	25	0	0	0	0	8	0	17	58	33	42
	2.	0	0	42	42	0	8	58	58	67	67	0	8	0	0	0	0	0	0	25	33	17	42
	3.	0	0	17	17	0	0	75	75	67	75	8	25	0	0	0	0	0	0	8	25	42	50
	4.	50	50	17	17	0	0	83	92	75	83	8	8	0	0	0	0	0	0	42	42	17	42
	Av.	14	17	23	23	0	2	71	79	64	72	8	17	0	0	0	0	2	0	23	39	27	44
14.	1.	0	0	8	8	0	0	75	83	83	83	8	25	0	0	0	0	0	0	25	33	25	33
	2.	8	8	8	8	0	0	42	67	42	58	42	42	0	0	0	0	0	0	0	8	0	17
	3.	0	0	25	25	0	0	58	75	58	67	33	33	0	0	0	0	0	0	17	17	17	25
	4.	0	0	0	0	0	0	75	83	42	58	17	17	0	0	0	0	0	8	67	67	33	33
	Av.	2	2	10	10	0	0	62	77	56	67	25	29	0	0	0	0	0	2	27	31	19	21
EMERGENCE/REPLICA																							
Seedlings																							
	1.	10	14	32	32	0	0	114	135	86	112	19	36	1	1	0	0	1	3	33	60	44	54
	2.	6	9	44	48	1	1	106	114	95	101	39	43	1	2	0	0	3	10	23	41	38	55
	3.	6	4	28	29	0	4	119	131	108	115	44	57	1	4	3	1	6	8	59	66	46	58
	4.	12	12	22	25	0	0	122	127	97	106	30	34	3	4	0	1	6	7	49	53	40	54
Percentage																							
	1.	6	8	19	19	0	0	68	80	57	67	11	21	.6	.6	0	0	6	2	20	36	26	32
	2.	4	5	26	29	.6	.6	63	68	57	60	23	26	.6	1	0	0	2	6	14	24	23	33
	3.	4	2	17	17	0	2	71	78	64	68	26	34	.6	2	2	.6	4	5	35	39	21	34
	4.	7	7	13	15	0	0	73	76	58	63	18	20	2	2	0	.6	4	4	29	31	24	32
TOTAL EMERGENCE																							
Seedlings		34	39	126	134	1	5	461	507	386	434	132	170	6	11	3	2	16	28	164	220	168	221
Percentage		5	6	19	20	.15	.74	69	75	57	64	20	25	.89	2	.45	.3	2.38	4	24	33	25	33

NOTE: Data expressed in percentages.
* - First column was collected in September 1982.
+ - Second column was collected in June 1982.

Table VI summarizes the total number of weeds of all species and average number of weeds per m^2 in all four replicas for each chemical treatment plus weedy and hand-weeded plots. Purslane is expressed as the percentage of trial plot covered by this weed.

Conclusion:

Total germination of the seeded deciduous crops can be summarized as follows:

Less than 10% germination:	- nanking cherry - chinese bush cherry - siberian crabapple - bur oak - albol currant
Between 20% and 40% germination	- chokecherry - mongolian cherry - buffalo berry - russian olive
Over 60% germination	- western sandcherry - mayday

It does not appear that any particular chemical treatment was of consequence in effecting germination. The ability of the seed to emerge was the deciding factor for stocking.

Weed Growth: Suppression of the occurrance of weeds by applying herbicides as used in the trial appears to be evident. The non-weeded trial has a total of 976 weeds per 4 replica's, which is the highest on record; Oxadiazon (2.5 kg) and Linuron (1.7 Kg) have the greatest effect on reducing the weed growth in general. Oxyfluorfen has a high degree of suppression of purslane in particular. (Any of the 3 used rates is effective but the rate of 1.6 Kg is the most effective in the suppression of purslane.) Also Trifluralin appears to suppress purslane emergence but to a lesser degree. (See Table VI for these details.

Since during the spring run-off erosion occurred, one third of the trial plots, located on a sloped area on Field #8A, was washed out. Because of erosion, comparisons are difficult to make and the trial will be repeated in 1983 with the following changes:

1. Species deleted:
   Siberian Crabapple (Malus Baccata)

2. Chemicals Deleted:
   Linuron (Afolan F - 0.8 Kg ai/ha)
   and Oxadiazon (Ronstar 2G - 2.5 kg ai/ha)

3. The 1983 herbicidal weed control trial will have 25 seeds per species in each plot instead of the previous 12 seeds per species in each plot.

TABLE IV: WEED CONTROL RATINGS

No. of Weed Per Treatment in 4 Replicas - June 1982

		RATE Kg ai/ha	STINKWEED				SHEPHERD'S PURSE				FLIXWEED				PINEAPPLE				WILD BUCKWHEAT				PORTULACA				SPEAR LEAVED GOOSE-FOOT				COMMON GROUNDSEL			
	REPLICA'S		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
PLOT #	CHEMICAL																																	
1.	LINURON	0.85	41	15	8	37	32	17	5	1	24	8	2	1	11	7	9	15	4	14	22	42	100	50	15	10	0	6	15	28	7	4	7	10
2.	LINURON	1.7	16	15	12	20	9	5	3	1	17	20	3	4	8	7	12	8	2	12	40	4	50	30	25	10	0	4	20	12	5	3	8	9
3.	ETHALFLURALIN	1.0	11	22	30	24	67	43	35	33	31	28	23	7	22	8	35	21	0	3	6	4	1	10	6	0	1	0	10	1	9	4	7	9
4.	ORYZALIN	1.0	20	29	18	60	35	29	11	17	32	33	7	10	12	3	9	11	4	6	15	2	64	25	22	5	10	0	9	13	2	2	3	2
5.	CHLOROXURON	4.0	23	18	16	44	23	31	6	17	16	15	3	12	5	5	18	50	14	9	14	1	32	20	30	5	4	2	11	40	6	2	0	4
6.	TRIFLURALIN	1.0	13	37	11	54	49	28	35	30	54	14	31	6	1	7	36	48	3	2	7	0	0	0	10	2	0	0	2	16	6	3	6	1
7.	TRIFLURALIN	2.0	20	33	26	67	43	11	37	30	67	12	6	35	5	1	31	36	17	0	6	2	50	1	11	0	4	0	8	13	3	8	1	2
8.	NAPROPAMIDE	2.0	50	26	4	43	36	23	13	16	33	32	2	17	6	11	20	28	13	16	65	10	50	50	10	45	6	3	37	43	2	5	0	1
9.	NAPROPAMIDE	4.0	34	23	7	66	28	21	17	0	9	22	9	8	5	4	12	1	12	4	24	8	7	45	20	10	4	4	19	12	5	4	0	1
10.	OXADIAZON	2.5	8	13	24	31	40	15	9	18	15	11	12	7	2	1	33	37	12	10	17	7	17	4	11	10	4	2	16	17	20	1	2	3
11.	OXYFLUORFEN	0.8	63	28	22	19	45	5	17	43	23	14	9	16	4	11	35	79	13	6	47	1	15	12	15	10	5	7	26	46	2	2	5	6
12.	OXYFLUORFEN	1.6	41	23	11	34	35	19	18	25	21	18	6	26	5	16	20	72	18	3	70	1	5	50	10	10	1	8	19	33	6	8	8	0
13.	WEEDY CHECK	n/a	36	50	13	22	71	27	14	31	44	7	17	35	7	6	27	91	10	2	25	3	25	25	15	25	3	4	23	52	5	3	7	1
14.	HANDWEEDED CHECK	n/a	3	33	0	1	7	6	1	5	1	5	1	2	1	3	11	4	3	3	4	2	50	50	50	50	0	2	24	24	1	2	4	1

TABLE V: WEED CONTROL RATINGS

No. of Weed Per Treatment in 4 Replicas - July 1982

PLOT #		RATE Kg ai/ha	% PORTULACA				WILD MUSTARD				REDROOT PIGWEED				COMMON GROUNSEL				SHEPHERD'S PURSE				PINEAPPLE				DANDELION			
	REPLICA'S		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	CHEMICAL																													
1.	LINURON	0.85	100	90	80	75	14	34	8	2	12	2	16	13	15	14	16	11	5	8	3	5	0	2	7	0	6	7	0	2
2.	LINURON	1.7	100	90	80	80	27	8	0	2	3	4	9	13	9	14	12	8	13	12	2	4	0	8	0	0	10	4	10	4
3.	ETHALFLURALIN	1.0	75	70	30	40	18	72	8	18	5	3	5	5	9	7	9	22	17	8	8	9	2	2	1	4	7	5	8	3
4.	ORYZALIN	1.0	90	80	50	45	26	34	3	9	8	7	7	9	14	17	8	9	19	12	3	5	0	3	5	0	6	7	7	2
5.	CHLOROXURON	4.0	80	80	10	70	18	18	6	11	6	5	8	10	23	12	21	10	11	8	5	8	0	3	0	2	6	1	8	5
6.	TRIFLURALIN	1.0	20	30	40	60	23	45	14	13	0	10	10	12	8	23	10	6	12	14	5	2	0	3	0	5	2	8	8	3
7.	TRIFLURALIN	2.0	20	20	20	40	26	30	12	8	0	7	8	4	9	20	7	10	4	10	4	5	2	3	2	1	4	4	5	2
8.	NAPROPAMIDE	2.0	100	90	80	90	22	42	12	9	10	8	7	13	11	18	4	3	11	7	2	2	0	0	0	2	5	4	2	6
9.	NAPROPAMIDE	4.0	100	90	70	80	23	53	13	5	9	17	9	9	12	12	8	4	13	5	7	4	0	0	1	0	7	3	10	2
10.	OXADIAZON	2.5	25	20	10	10	26	7	8	4	1	8	9	2	8	8	5	9	10	12	3	5	0	2	3	0	4	5	5	2
11.	OXYFLUORFEN	0.8	15	10	10	20	36	75	25	6	2	12	12	1	13	5	5	4	8	8	5	6	0	2	0	2	2	0	8	2
12.	OXYFLUORFEN	1.6	0	10	10	0	25	70	10	9	1	10	8	6	7	10	7	2	5	3	8	2	1	0	0	4	2	2	4	3
13.	WEEDY CHECK	n/a	80	90	80	100	38	52	32	6	4	8	14	15	3	14	18	3	9	12	0	5	0	2	0	0	3	5	2	5
14.	HANDWEEDED CHECK	n/a	80	100	100	100	5	30	10	7	0	0	5	10	0	8	8	4	0	7	4	4	0	2	2	2	3	8	8	8

NOTE: Portulaca expressed in percentages of area coverage.

TABLE VI: WEED CONTROL FOR SEEDED NURSERY CROP AS RELATED TO HERBICIDAL TREATMENTS

PLOT NO.	CHEMICAL	RATE Kg ai/ha	NO. OF WEEDS PER TREATMENT		% OF PURSLANE PER TREATMENT
			IN 4 REPLICAS	AVE./M^2	IN 4 REPLICAS
1.	Linuron	0.85	769	30	86%
2.	Linuron	1.7	570	22	87%
3.	Ethalfluralin	1.0	766	30	54%
4.	Oryzalin	1.0	740	28	66%
5.	Chloroxuron	4.0	701	27	60%
6.	Trifluralin	1.0	748	29	37%
7.	Trifluralin	2.0	773	30	25%
8.	Napropamide	2.0	916	35	90%
9.	Napropamide	4.0	671	26	85%
10.	Oxadiazon	2.5	575	22	16%
11.	Oxyfluorfen	0.8	890	34	14%
12.	Oxyfluorfen	1.6	839	32	5%
13.	Weedy Check	n/a	976	38	87%
14.	Handweeded Check	n/a	489	19	95%

NOTE: Area of four replicas = 25.92 m^2

INVESTIGATION #42-82

OVERWINTERING TRIAL OF LARGE CONTAINER STOCK

Progress Report - 1983

PURPOSE:

This trial was established in 1982 in order to determine the most desirable winter storage conditions for nursery stock grown in containers.

METHOD:

The test period will cover three growing seasons.

Species involved are:

1. Picea Glauca (White Spruce)
2. Pinus Contorta var. Latifolia (Lodgepole Pine)
3. Pinus Banksiana (Jack Pine)
4. Larix Siberica (Siberian Larch)
5. Betula Papyrifera (White Birch)
6. Populus Deltoides (Cottonwood Poplar)
7. Salix sp. (Native Willow)
8. Prunus virginiana (Chokecherry)
9. Amelanchier Alnifolia (Saskatoon)
10. Lonicera Tatarica (Honeysuckle)

All planting stock was available in 2 gallon containers and as close as possible selected to sizes ranging between 25 and 30 cm in height development.

The winter storage conditions of the planting stock varies in the following 6 methods, with a control which is equal to the general conditions of all the existing potted stock at the Alberta Tree Nursery.

CONDITION NUMBER	DESCRIPTION
#1.	Containers were placed on a solid base, upright, without mulching.
#2.	Containers were placed on a solid base, upright, with cone mulching between the pots.
#3.	Containers were buried up to the rim in peat moss.
#4.	Containers were laid flat (horizontal) without covering the branches and pots.
#5.	Containers were laid horizontal and covered with a micro blanket.
#6.	Containers were laid horizontal and covered with polyfilm.
#7.	Control - containers were kept in lathhouse #4 on an elevated base on which all containers are kept during the growing season.

Summer growing conditions of the experimental stock will be similar to the general pot growing conditions which apply to the existing material.

On October 21 and 22, 1982 all trial stock - except control - was transferred to the winter storage area west of Lathhouse #4. For a diagram of the layout see Table I. The sequence of the treatments in the replica's is identical, since the 6 treatments do not influence each other.

1. On October 21 and 22 all trial stock was transferred to the winter storage west of Lathhouse #4 where all requested modifications were completed except #A5, B5, C5 and A6, B6 and C6.

2. On November 15, 1982 - A6, B6 and C6 were cleared of snow and trial plots were covered with polyfilm while on November 18, 1982 trial modifications #5 (A5, B5, C5) were covered with a microblanket.

Observations regarding snow conditions are being taken during the 1982-83 winter season. Results of winter survival of experimental potted plants will be recorded when available.

TABLE I: DIAGRAM OF OVERWINTERING CONDITIONS

CONDITIONS	REPLICA "A"	NO.	SPECIES
#1. Pots Upright (No Treatment)	o-o-o-o-o-o-o-o	1.	White Spruce
	o-o-o-o-o-o-o-o	2.	Lodgepole Pine
	o-o-o-o-o-o-o-o	3.	Jack Pine
	o-o-o-o-o-o-o-o	4.	Siberian Larch
	o-o-o-o-o-o-o-o	5.	White Birch
	o-o-o-o-o-o-o-o	6.	Cottonwood Poplar
	o-o-o-o-o-o-o-o	7.	Native Willow
	o-o-o-o-o-o-o-o	8.	Chokecherry
	o-o-o-o-o-o-o-o	9.	Saskatoon
	o-o-o-o-o-o-o-o	10.	Honeysuckle
#2. Pots Upright (Cones to Soil Level)	o-o-o-o-o-o-o-o	1.	White Spruce
	↓		
	o-o-o-o-o-o-o-o	10.	Honeysuckle
#3. Pots Upright (Peat Moss to Soil Level)	o-o-o-o-o-o-o-o	1.	White Spruce
	↓		
	o-o-o-o-o-o-o-o	10.	Honeysuckle
#4. Pots Horizontal (No Treatment)	x-x-x-x-x-x-x-x	1.	
	↓		
	x-x-x-x-x-x-x-x	10.	
#5. Pots Horizontal (Covered with Microblanket)	x-x-x-x-x-x-x-x	1.	
	↓		
	x-x-x-x-x-x-x-x	10.	
#6. Pots Horizontal (Covered with Polyfilm)	x-x-x-x-x-x-x-x	1.	
	↓		
	x-x-x-x-x-x-x-x	10.	
#1.	REPLICA "B" →		SAME AS "A"
↓	↓		
#6.			
#1.	REPLICA "C" →		SAME AS "A"
↓	↓		
#6.			

o-o indicates upright pots
x-x indicates horizontal pots

INVESTIGATION #41-82

CONTAINER VS. BAREROOT PLANTS

Progress Report

OBJECTIVE:

This field experiment was established in 1982 as a joint research program by the A.T.N. & H.C. at Oliver and the A.H.R.C. at Brooks in order to study the growing differences, if any, of container and bareroot woody plants.

METHOD:

By the start of May 1982, 180 - 2 gallon containers and 180 bareroots of the following six deciduous and coniferous plant species (60 plants per species) were selected:

White Spruce (Picea glauca)
Northwest Poplar (Populus northwest)
Green Ash (Fraxinus pennnsylvanica)
Chokecherry (Prunus virginiana)
Honeysuckle (Lonicera tatarica)
Silver Buffaloberry (Shepherdia argentea)

One half of these (90 containers + 90 bareroots) were planted. (Field Plan Attached) immediately on Field #18 at the A.T.N. & H.C. where they will be monitored for a period of five years.

The following trees died shortly after 1982 spring planting and were replaced in the fall of 1982:

1. 2 Silver Buffaloberry (bare root)
   Replaced September 24, 1982
2. 4 Poplars (bare root)
   Replaced September 27, 1982

The species of siberian larch, saskatoon and lodgepole pine were, at time of starting this trial, not available in the proper size. These species will be added at a later date.

All trees were watered thoroughly after planting and four times during the growing season (2-3 gallons of water per tree). Throughout the summer the area around the trees was hand weeded while the aisles were rototilled.

OBSERVATIONS:

1. During the 1982 growing season all experimental trees and shrubs were relatively disease and insect free except for the chokecherries which were treated with Methoxychlor (50 ml/10 litre of H_2O) for flea beatles in June.

2. The height increase and diameter increase at the root/stem collar was measured at the termination of the growing season (Fall '82). Tables I and II document this observation. Table I for the bare rooted plants and Table II for the container grown plants. No observations were recorded for the fall planted chokecherry and no stem diameters were measured for the shrubs, silverbuffaloberry and honeysuckle. Table III summarizes this data.

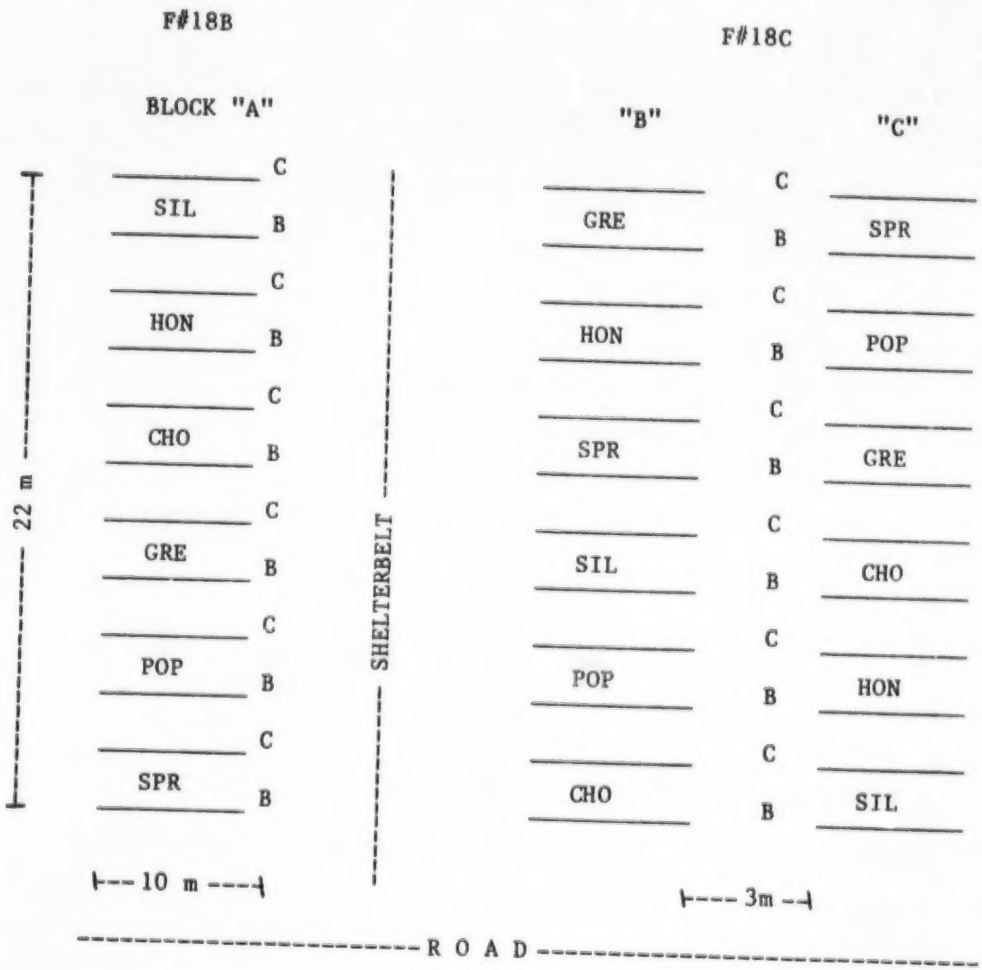
DISCUSSION:

This trial is intended to be monitored for 5 years. The first growing season will mainly serve for establishing the trial.

Collected data so far clearly demonstrates the superior height increase of container grown northwest poplar over the bare rooted stock. The same holds true for the rootcellar diameter increase of this species.

The other species do not show significant growth differential between the two types of plants at this time.

PLANTING PLAN



CODE:

SPR - White Spruce
POP - Northwest Poplar
GRE - Green Ash
CHO - Chokecherry
HON - Honeysuckle
SIL - Silver Buffaloberry
Planted May '82

NOTE:

There are 5 plants per 10 m of row.
ORIGIN: B - Bareroot
C - Container

SPACING: 2 meters between rows
2.5 m between each tree

TABLE 1:

1982 SEASONAL GROWTH INCREASE OF BARE ROOT SPECIES

SPECIES	PLANT #	JUNE HEIGHT (CM) A*	B	C	JUNE COLLAR DIAMETER (mm) A	B	C	SEPTEMBER HEIGHT (CM) A	B	C	SEPTEMBER COLLAR DIAMETER (mm) A	B	C	YEARLY INCREASE - 1982 HEIGHT (CM) A	B	C	AVE.	YEARLY INCREASE - 1982 COLLAR DIAMETER (mm) A	B	C	AVE.	AVE. INCREASE PER SPECIES HEIGHT	C.D.
WHITE SPRUCE	1	57	59	66	16.4	15.7	15.9	58	68	66	16.6	15.9	17.5	1	9	¶	3.3	.2	.2	1.6	0.67	)	
	2	55	58	60	16.5	16.0	15.6	62	58	71	16.6	16.7	23.2	7	¶	11	6.0	.1	.7	7.6	2.80	)	
	3	55	56	57	15.0	15.3	14.0	63	64	64	15.2	15.7	22.0	8	8	7	7.7	.2	.4	8.0	2.87	) 5.80	2.15
	4	53	58	60	15.2	16.3	14.5	58	75	65	15.5	16.3	19.0	5	17	5	9.0	.3	¶	4.5	1.77	)	
	5	48	63	52	15.3	18.0	14.4	49	57	60	22.0	18.1	16.0	1	¶	8	3.3	6.7	.1	1.6	2.80	)	
NORTHWEST POPLAR	1	28	28	30	6.8	5.8	7.9	75	46	D	13.1	9.5	D	47	18	D	32.5	6.3	3.7	D	5.00	)	
	2	32	27	30	5.3	6.5	6.5	26	D	59	6.1	D	9.9	¶	D	29	14.5	.8	D	3.4	2.10	)	
	3	35	30	24	9.8	7.9	9.3	47	56	52	11.2	12.4	11.0	12	26	28	22.0	1.4	4.5	1.7	2.53	)22.18	2.88
	4	38	33	26	7.2	6.8	5.7	60	D	37	10.4	D	8.1	22	D	11	16.5	3.2	D	2.4	2.80	)	
	5	33	33	35	5.9	8.1	7.7	14	84	D	6.2	12.0	D	¶	51	D	25.5	0.3	4.0	D	2.15	)	
GREEN ASH	1	30	23	22	5.4	4.7	4.0	80	32	47	11.8	7.4	10.3	50	9	25	28.0	6.4	2.7	6.3	5.13	)	
	2	27	23	25	6.8	7.9	4.3	64	33	46	10.0	7.9	8.8	37	10	21	22.7	3.2	.05	4.5	2.58	)	
	3	29	23	21	4.2	7.5	4.0	66	38	43	11.7	7.6	5.5	37	15	22	24.7	7.5	0.1	1.5	3.03	)19.87	2.99
	4	26	23	20	4.0	4.0	4.5	31	44	32	5.9	10.3	5.3	5	21	12	12.7	1.9	6.3	0.8	3.00	)	
	5	36	22	27	5.3	7.0	5.7	47	36	36	8.2	7.4	6.0	11	14	9	11.3	2.9	0.4	0.3	1.20	)	
SILVER BUFFALOBERRY	1	30	30	38				56	35	48				26	5	10	13.7					)	
	2	36	19	36				42	34	54				6	15	18	13.0					)	
	3	33	26	30		N/A		51	20	D		N/A		18	¶	D	9.0		N/A			)13.23	N/A
	4	30	21	41				56	D	33				26	D	¶	13.0					)	
	5	35	25	38				53	54	39				18	29	1	16.0					)	
HONEYSUCKLE	1	25	24	27				71	64	27				46	40	¶	28.7					)	
	2	30	24	25				108	16	78				78	¶	53	43.7					)	
	3	32	7	25		N/A		73	26	56		N/A		41	19	31	30.3		N/A			)38.67	N/A
	4	31	30	25				79	77	84				48	47	59	51.3					)	
	5	33	24	33				85	56	67				52	32	34	39.3					)	
CHOKECHERRY +	1																						
	5	----			---			---			----			-----				----				----		

¶ - No Height Increase D - Dead * - Replica N/A - Collar Diameter not applicable for Shrubs C.D. - Collar Diameter

+ - Bare Root Chokecherry not planted in Spring 1982.

TABLE II:

1982 SEASONAL GROWTH INCREASE OF CONTAINER SPECIES

SPECIES	PLANT #	JUNE HEIGHT (CM)			JUNE COLLAR DIAMETER (mm)			SEPTEMBER HEIGHT (CM)			SEPTEMBER COLLAR DIAMETER (mm)			YEARLY INCREASE - 1982 HEIGHT (CM)				YEARLY INCREASE - 1982 COLLAR DIAMETER (mm)				AVE. INCREASE PER SPECIES	
		A*	B	C	A	B	C	A	B	C	A	B	C	A	B	C	AVE.	A	B	C	AVE.	HEIGHT	C.D.
WHITE SPRUCE	1	69	57	59	13.7	12.4	14.2	78	65	69	14.9	13.4	17.4	9	8	10	9.0	1.2	1.0	3.2	1.80		
	2	54	59	61	11.6	13.5	13.4	59	64	76	13.0	14.0	14.0	5	5	15	8.3	1.4	0.5	0.6	0.83		
	3	60	61	52	16.5	14.7	15.9	69	69	60	18.3	15.0	16.4	9	8	8	8.3	1.8	0.3	0.5	0.87	9.67	1.75
	4	58	59	65	13.4	14.5	14.3	72	74	75	17.6	17.1	15.8	14	15	10	13.0	4.2	2.6	1.5	2.77		
	5	60	62	61	11.1	14.8	12.3	71	70	71	16.6	15.0	14.0	11	8	10	9.7	5.5	0.2	1.7	2.47		
NORTHWEST POPLAR	1	49	44	47	6.9	7.9	7.1	115	109	112	19.0	14.1	16.0	66	65	65	65.3	12.1	6.2	8.9	9.07		
	2	47	48	42	6.8	7.8	6.5	75	103	119	12.6	12.8	15.6	28	55	77	53.3	5.8	5.0	9.1	6.63		
	3	47	46	42	7.0	7.2	6.8	72	106	82	11.7	16.9	11.8	25	60	40	41.7	4.7	9.7	5.0	6.47	53.27	7.14
	4	49	48	48	7.4	7.4	7.8	94	123	100	13.2	19.5	13.6	45	75	52	57.3	5.8	12.1	5.8	7.90		
	5	45	47	41	5.8	7.6	6.5	92	120	67	12.4	16.0	8.4	47	73	26	48.7	6.6	8.4	1.9	5.63		
GREEN ASH	1	34	35	35	7.8	10.5	5.6	68	49	49	15.5	11.2	10.4	34	14	14	20.7	7.7	0.7	4.8	4.40		
	2	55	36	38	10.0	8.5	7.7	82	64	45	13.5	11.4	14.5	27	28	7	20.7	3.5	2.9	6.8	4.40		
	3	53	57	53	10.9	10.5	9.4	85	63	50	14.1	13.2	13.6	32	6	¶	12.7	3.2	2.7	4.2	3.37	13.87	3.71
	4	45	37	54	8.1	9.8	8.3	65	54	60	14.1	14.3	10.2	20	17	6	14.3	6.0	4.5	1.9	4.13		
	5	58	50	52	9.5	10.0	8.8	60	49	53	12.0	13.1	10.0	2	¶	1	1.0	2.5	3.1	1.2	2.27		
SILVER BUFFALOBERRY	1	65	41	54				86	55	64				21	14	10	15.0						
	2	68	47	34				79	68	49				11	21	15	15.7						
	3	58	52	52		N/A		98	78	61		N/A		40	26	9	25.0		N/A			18.47	N/A
	4	48	54	44				68	70	63				20	16	19	18.3						
	5	59	47	55				74	79	63				15	32	8	18.3						
HONEYSUCKLE	1	38	16	52				48	52	118				10	36	66	37.3						
	2	43	17	27				83	80	76				40	63	49	50.7						
	3	43	36	37		N/A		48	76	49		N/A		5	40	12	19.0		N/A			34.27	N/A
	4	31	41	41				60	90	48				29	49	7	28.3						
	5	37	37	31				66	75	72				29	38	41	36.0						
CHOKECHERRY	1	56	55	43				56	58	62				¶	3	19	7.3						
	2	54	54	38				68	62	92				14	8	54	25.3						
	3	59	62	49		N/A		82	63	48		N/A		23	1	¶	8.0		N/A			8.93	N/A
	4	57	52	54				59	53	57				2	1	3	2.0						
	5	38	55	43				42	55	45				4	¶	2	2.0						

C.D. - Collar Diameter ¶ - No Height Increase N/A - Collar Diameter not applicable for Shrubs * - Replica

TABLE III: SEASONAL 1982 GROWTH COMPARISON OF CONTAINER AND BAREROOT STOCK

SPECIES	AVERAGE HEIGHT INCREASE (CM)				AVERAGE COLLAR DIAMETER GROWTH (MM)			
	CONTAINER	BAREROOT	DIFFERENCE CONTAINER	DIFFERENCE BAREROOT	CONTAINER	BAREROOT	DIFFERENCE CONTAINER	DIFFERENCE BAREROOT
White Spruce	9.67	5.80	3.87	---	1.75	2.15	---	0.40
Northwest Poplar	53.27	22.18	31.09	---	7.14	2.88	4.26	----
Green Ash	13.87	19.87	---	6.00	3.71	2.99	0.72	----
Silver Buffaloberry	18.47	13.23	5.24	---	n/a	n/a	n/a	n/a
Honeysuckle	34.27	38.67	---	4.40	n/a	n/a	n/a	n/a
Chokecherry	8.93	n/a	---	---	n/a	n/a	n/a	n/a